DOCUMENT RESUME

ED 455 786 IR 020 742

AUTHOR Murry, G. Brandon; Murry, Francie R.

TITLE Analysis of a Customized Intervention for the Development of a Web-Based Lesson by Pre-Service Teachers.

PUB DATE 2000-10-00

NOTE 10p.; In: Annual Proceedings of Selected Research and Development Papers Presented at the National Convention of the Association for Educational Communications and Technology (23rd, Denver, CO, October 25-28, 2000). Volumes 1-2; see IR 020 712.

PUB TYPE Reports - Research (143) -- Speeches/Meeting Papers (150)

EDRS PRICE MF01/PC01 Plus Postage.

DESCRIPTORS Comparative Analysis; Computer Assisted Instruction; Educational Technology; Higher Education; *Instructional Design; *Instructional Development; *Instructional Effectiveness; Instructional Materials; Lesson Plans; Preservice Teacher Education; World Wide Web

ABSTRACT

This study compared the use of two developmental alternatives: a Web Editor (WE) in combination with a customized template/shell (Teaching Not Teaching, T-N-T) and a WE only, for development of a Web-based lesson by pre-service teachers. Six hypotheses were tested to find whether the WE and T-N-T alternative was more efficient, effective, and appealing than the WE only development alternative. The efficiency, effectiveness, and appeal of developing a Web-based lesson was examined using these variables: lesson creation time; perceived effort; inclusion of six specified instructional components; functionality of six specified technical components; teacher appeal; and likelihood of intended future use (dependent variables) and the lessons development alternatives WE and T-N-T or WE only (independent variable). A quasi-experimental design and t-test analyses were employed. Pre-service teachers (N=103) were assigned to one of the two development alternatives. Instruments included researcher-developed evaluations, self-report tools and the Computer Attitude Scale. Dependent variables investigated in this study included: lesson creation time; perceived effort; inclusion of six specified instructional components; functionality of six technical components; teacher appeal; and rate of future use. Statistical analysis of six hypotheses conformed that developing Web-based lessons using WE and T-N-T was more effective than using WE only. The analysis also revealed that neither developmental alternative was superior in terms of efficiency or appeal. (Author)

Reproductions supplied by EDRS are the best that can be made
from the original document.

ED 455 786

Analysis of a Customized Intervention for the Development of a Web-based Lesson by Pre-service Teachers

U.S. DEPARTMENT OF EDUCATION
Office of Educational Research and Improvement
EDUCATIONAL RESOURCES INFORMATION CENTER (ERIC)
This document has been reproduced as received from the person or organization originating it.
Minor changes have been made to improve reproduction quality.
Points of view or opinions stated in this document do not necessarily represent official OERI position or policy.

M. Simonson

G. Brandon Murry
Francie R. Murry
University of Northern Colorado

Abstract

This study compared the use of two developmental alternatives: a Web Editor (WE) in combination with a *customized template/shell (Teaching Not Teching, T-N-T) and a Web Editor (WE) only, for development of a Web-based lesson by pre-service teachers. Six hypotheses were tested to find whether the WE + T-N-T alternative was more efficient, effective, and appealing than the WE only development alternative. The efficiency, effectiveness, and appeal of developing a Web-based lesson was examined using these variables; lesson creation time, perceived effort, inclusion of six specified instructional components, functionality of six specified technical components, teacher appeal, and likelihood of intended future use (dependent variables) and the lessons development alternatives WE + T-N-T or WE only (independent variable).*

A quasi-experimental design and t-test analyses were employed. Pre-service teachers (N = 103) were assigned to one of the two development alternatives. Instruments included researcher-developed evaluations, self-report tools and the Computer Attitude Scale (CAS). Dependent variables investigated in this study include: lesson creation time, perceived effort, inclusion of six specified instructional components, functionality of six technical components, teacher appeal, and rate of future use. Statistical analysis of six hypotheses confirmed that developing Web-based lessons using WE + T-N-T was more effective than using WE only. The analysis also revealed that neither developmental alternative was superior in terms of efficiency or appeal.

Purpose of the Study

A report from the National Center for Educational Statistics (NCES) (1999) details that although educational technology is considered a means for transforming education, only 20% of teachers feel well prepared to integrate technology into classroom instruction. This study examines a tool for promoting technology integration through pre-service teacher skill acquisition and application of Web-based lesson development when presented through two different alternatives (WE + T-N-T and WE only). This study investigated whether using a Web editor (WE) in conjunction with a custom created template/shell (T-N-T: Teaching Not Teching) is more efficient, effective, and appealing for pre-service teachers to use in the development of Web-based lessons than using a Web editor only. The WE used in this study was Microsoft FrontPage 2000.

Each pre-service teacher created a Web-based lesson using one of two lesson development alternatives. The Web-based lessons were then evaluated using three criteria: efficiency, effectiveness, and appeal. Comparison of 16 variables/sub-variables was made between lessons created with WE + T-N-T and WE only.

The three criteria for usability was applied in the evaluation phase to determine if one Web-based lesson development alternative provides better support for pre-service teachers compared to another alternative. Teachers must have access to technological innovations that help them meet the needs of a diverse audience, get the job done quickly, and have the ability to integrate best practices into the interface design and lesson content.

Description of the Sample

During the 1999-2000 Fall Semester, 161 pre-service teachers were enrolled in four sections of ET 347 Educational Technology Applications for Elementary Teaching, one section of ET 348 Educational Technology Applications for Middle Grades Teaching, and three sections of ET 349 Educational Technology Applications for Secondary Teaching. All of these students were invited to participate in this study. Permission to participate was received from a total of 144 students. Each student completed the Demographics Questionnaire and the Consent Form during the first class session. Of the 144 students in the study, half were identified as the Control group while the remaining students were identified as the Treatment group.

The groups were selected by nonrandom methods; however, the intact sections were randomly assigned to treatment groups. Two of the four sections of ET 347 (elementary pre-service teachers) were randomly assigned to the Control group and the remaining two sections were assigned to the Treatment group. Two groups of ET 349

IR020742

BEST COPY AVAILABLE

(secondary pre-service teachers) were drawn and assigned to the Control and one remaining section of ET 349 and one section of ET 348 (middle grades pre-service teachers) were assigned to the Treatment group.

Forty-one of the 144 students (28.47%) who had agreed to participate in the study either did not complete their Web-based lesson or other required instruments and subsequently were eliminated from the study. Thus, this study's sample consisted of 103 students, that is, 64% of the Educational Technology students who initially had been invited to participate. Final group size for the Control group was 52 and for the Treatment group was 51.

The intact class sizes ranged from 16 to 26 students. The classes were scheduled for 50 minutes and met on the following days and times; two Monday classes at 12:20 and 1:25 PM, one Tuesday class at 9:05 AM, three Wednesday classes at 8:00 AM, 12:20, and 1:25 PM, one Thursday class at 6:00 PM, and one Friday class at 10:10 AM.

Research Questions

The research questions were centralized around the usability/evaluation criteria efficiency, effectiveness, and appeal as follows:

Efficiency

RQ_1: Are pre-service teachers able to develop a Web-based lesson in less time when they use WE + T-N-T than when they develop a Web-based lesson using WE only?

RQ_2: Will pre-service teachers perceive that less effort is required by using WE + T-N-T than when they develop Web-based lessons using WE only?

Effectiveness

RQ_3: Are the six specified instructional components (lesson goal(s), objectives written in performance-based terms, student performance, student performance evaluation, student-to-teacher contact, and location cues in the site) present when pre-service teachers develop a Web-based lesson using WE + T-N-T and when using WE only?

RQ_4: If present, which of the six specified technical components (navigation, image presence, mailto links, interactive mechanism, audio and video) are functional when pre-service teachers develop a Web-based lesson using WE + T-N-T and when using WE only?

Appeal

RQ_5: What degree of teacher appeal is elicited from pre-service teachers' interaction with the development process of a Web-based lesson using WE + T-N-T and from pre-service teachers who use WE only?

RQ_6: Do pre-service teachers intend to continue Web-based lesson development with the lesson development alternative they used in the study in their future instructional settings?

Research Design

This study is quasi-experimental (Smith & Glass, 1987). That is, the independent variable is an introduced treatment, although there will not be total control over which participants receive which treatment. Participants were selected by nonrandom methods and then the intact sections were randomly assigned to treatment groups. This research paradigm may be represented as follows:

Group I WE only	R	O_1		O_2
	---	---	---	---
Group II WE + T-N-T	R	O_1	X	O_2

R = Random assignment of treatment to intact classes, Consent Form, Demographic Questionnaire

O_1 = Instruction on how to use the Web editor

X = Intervention treatment (T-N-T)

O_2 = Work Time-Log, Effort Questionnaire, Instructional Components Evaluation Checklist, Technical Components Evaluation Checklist, Computer Attitude Scale (CAS), and Intended Future Use Questionnaire, Summary Data Sheet

Data Analysis

Results regarding the evaluation of the Web-based lessons created with a Web editor combined with a template shell structure from "Teaching-Not-Teching" (T-N-T) and those created using a Web editor (WE) only developed by pre-service teachers are presented in this section. The evaluation was based on the comparison criterion of efficiency, effectiveness and appeal. These variables were comprised of 16 sub-variables.

The t-test was used to analyze the data and determine if there was a significant difference between the Control and Treatment groups as measured by the 16 identified sub-variables. This study used six independent t-tests; therefore the probability of one or more Type-I errors was greater than the alpha set for any single t-test. Due to the multiple t-test error rate occurring from six t-tests, an alpha level of .0167 was set for each test resulting in an overall experiment-wise alpha of not more than .10. Given the exploratory nature of the study, this error range was judged appropriate. The research null hypotheses are presented with the related analyses and results.

H_{O1}: There is no statistically significant difference between length of time required to develop a Web-based lesson using WE + T-N-T compared to using WE only.

Based on the results of the independent t-test, H_{O1} was retained, indicating there was no difference in the time required by pre-service teachers to create a Web-based lesson using WE + T-N-T than when using WE only ($t = -0.9457$, $p = 0.1733$). Data were compiled and analyzed from the Work Time-Log. The results are presented in Table 1.

Table 1. Work Time-Log

Group	Mean Time (minutes)	SD (minutes)	df	p
Treatment ($n = 51$)	519.1764	215.3836	101	0.1733
Control ($n = 52$)	476.5384	241.1787		

Participants in the study used the Work Time-Log to record the number of minutes they spent designing and developing their Web-based lesson. The six specific tasks itemized on the Work Time-Log were: 1) Tinkering with the computer program, 2) Storyboarding, 3) Collecting images, audio, video, and other cool stuff, 4) Thinking about my Web-based lesson, 5) Collecting or creating lesson content, and 6) Developing Web-based lesson with the editor. Although there was not statistical significance between the total number of minutes participants from each group took to complete their lesson, participants in the Treatment group spent, on average, 43 more minutes than did the participants from the Control group.

H_{O2}: There is no statistically significant difference between perceived required effort when using WE + T-N-T compared to when WE only is used by pre-service teachers to develop a Web-based lesson.

H_{O2} was retained, suggesting no difference in the perceived effort by pre-service teachers when developing a Web-based lesson using WE + T-N-T than when using WE only ($t = 1.8673$, $p = 0.0324$). Data for this comparison were compiled from the Effort Questionnaire. The results of this analysis are found in Table 2.

Table2. Perceived Effort

Group	Mean Effort	SD	df	p
Treatment ($n = 51$)	7.0588	1.9226	101	0.0324
Control ($n = 52$)	6.3750	1.7928		

H_{O3}: There will be no statistically significant difference between the frequency of presence of the six specified instructional components (e.g., lesson goal(s), objectives written in performance-based terms, student performance activity, student performance evaluation, student-to-teacher contact, and location cues in the site) in a Web-based lesson when developed by pre-service teachers using WE + T-N-T than when developed using WE only.

H_{03} was rejected, indicating a significant statistical difference between the frequency of presence of the six specified instructional components in a Web-based lesson developed by pre-service teachers utilizing WE + T-N-T than when developed using WE only ($t = 18.5048$, $p = 0.0000$). Data were derived from a scale that ranged from a low of zero points to a high of six points. The data indicated a statistical favor for the WE + T-N-T group. See Table 3 to review the results.

Table3. Instructional Components

Group	Mean Score	SD	df	p
Treatment ($n = 51$)	5.3333	0.9933	101	0.0000*
Control ($n = 52$)	2.1153	0.7586		

* = $\alpha < 0.0167$

The six specific instructional components itemized on the Instructional Components Evaluation Checklist are as follows: 1) Lesson goal(s), 2) Objectives written in performance-based terms, 3) Student performance activity, 4) Student performance evaluation, 5) Student-to-teacher contact, and 6) User-location within the site cues. The Treatment group scored higher than the Control group on all six instructional components. Not one Web-based lesson developed by the participants in the Control group included Objectives written in performance-based terms, or Student performance activity, or Student performance evaluation.

Some participants from the Control group and the Treatment group designed what resembled an activity and/or quiz in their Web-based lesson but did not receive points for these components on the Instructional Components Evaluation Checklist. Operational definitions of these three variables follow.

Objectives written in performance-based terms: refers to a statement that describes what learners should be able to do when they have completed the lesson. "What learners 'do' must be observable so that the learners know that they have learned and what they have learned" (Smith & Ragan, 1993, p. 91).

Student performance activity: refers to eliciting specific behavior from the student based on the performance objectives for the lesson.

Student performance evaluation: refers to supplying the student with feedback on their performance based upon student performance activity.

The protocol in awarding points for these three variables was to first look for objectives written in performance-based terms. The performance objectives are the foundation for the other two variables and if there were no performance objectives contained in the lesson there could be no points awarded for either "student performance activity" or "student performance evaluation." As stated a-priori in the definition of "student performance activity," performance was based upon stated objectives and if objectives did not exist in the lesson no points were awarded for student performance activity. Furthermore, no points could be awarded for student performance evaluation, because as stated a-priori in the definition, "student performance evaluation is to be based upon student performance activity."

H_{04}: There will be no statistically significant difference between the frequency of functionality when the six specified technical components (e.g., navigation, image presence, mailto links, interactive mechanism, audio and video) are developed by pre-service teachers utilizing WE + T-N-T than when developed using WE only.

H_{04} was rejected, indicating significant statistical difference between the frequency of functionality of the six specified technical components: 1) Navigation, 2) Image presence, 3) Mailto links, 4) Interactive mechanism, 5) Audio, and 6) Video in Web-based lessons when developed by pre-service teachers utilizing WE + T-N-T than when developed using WE only ($t = 9.7680$, $p = 0.0000$). Data are derived from a scale that ranged from a low of zero points to a high of six points. The statistical preference was in favor of the WE + T-N-T.
T-N-T group. The results can be found in the following.

Table 4. Technical Components

Group	Mean Score	SD	df	p
Treatment (n = 51)	3.4901	0.6744	101	0.0000*
Control (n = 52)	2.0769	0.7883		

* = $\alpha < 0.0167$

The scores on the Technical Components Evaluation Checklist were based on functionality of the six specified technical components. Not one participant from either the Treatment or the Control group attempted to include component 5) Audio or 6) Video in their lesson. Of the four remaining technical components, the Treatment group scored higher on average in every component.

H_{O5}: There will be no statistically significant difference in the degree of teacher appeal expressed by pre-service teachers using WE + T-N-T toward developing Web-based lessons than from pre-service teachers using WE only.

H_{O5} was retained, indicating no statistically significant difference between the degree of positive teacher appeal from pre-service teachers using WE + T-N-T to develop Web-based lessons than from those using WE only ($t = -0.6403$, $p = 0.2617$). Data were compiled and analyzed from the Computer Attitude Scale (CAS). The four areas associated with the CAS (low anxiety, high confidence, liking, usefulness) revealed no statistically significant differences between the two groups. The results can be found in Table 5.

Table 5. Computer Anxiety Scale

Group	Mean Degree of Appeal	SD	df	p
Treatment (n = 51)	118.2450	16.7980	101	0.2617
Control (n = 52)	120.4807	18.5723		

H_{O6}: There will be no statistically significant difference between the likelihood of pre-service teachers' anticipation for developing Web-based lessons with either alternative in their future instructional settings.

H_{O6} is retained, suggesting no statistically significant difference in the anticipated future instructional development of Web-based lessons by pre-service teachers using WE + T-N-T to develop Web-based lessons or those using WE only ($t = -0.3946$, $p = 0.3470$). Data were compiled and analyzed from the Intended Future Use Questionnaire. See the results displayed in Table 6.

Table 6. Intended Future Use of Development Alternative

Group	Mean Score	SD	df	p
Treatment (n = 51)	8.4019	1.9053	94.3	0.3470
Control (n = 52)	8.5769	2.5540		

Appeal of the design/development process was addressed through the statistical examination of H_{O5} and H_{O6}. There was no statistical significance in the differences between the Control group and the Treatment group on H_{O5} or H_{O6}.

Talk-Aloud Interviews

The post-hoc talk-aloud interviews were completed by telephone with students from both the Control and Treatment groups. Two students were selected from each group based on most and least time recorded on the Work Time-Log. Two students from each group were also selected based on the highest and lowest compiled scores of the remaining five instruments (Effort Questionnaire, Instructional Components Evaluation Checklist, Technical Components Evaluation Checklist, Computer Attitude Scale, Intended Future Use Questionnaire). In theory, eight talk-aloud interviews would be performed, however, one of the individuals identified from the Control group fit in two categories (least time spent as recorded on the Work Time-Log and high composite score on the remaining five instruments), and therefore only seven participants were interviewed.

Data obtained from the anecdotal talk-aloud interviews revealed that one participant from the Treatment group had continued using the T-N-T template/shell after the study ended. He had recently completed his seventh lesson in only 20 minutes. His completion time for the initial use of T-N-T was 450 minutes. Although this finding is based upon a single data point, the substantial, reduction in development time needs to be explored further to determine if multiple use of the WE + T-N-T template and WE only results in similar outcomes.

Limitations

Due to several factors, the researcher or reader would be vulnerable in drawing direct conclusions from the results of this study. The following limitations of this study should be considered when attempting to generalize from the findings and/or to replicate the study.

The primary limitation of this study was the failure of the Control group to develop Web-based lessons that included the lesson components as defined within this study. According to the PTEP methods course syllabus, lessons components include goals, objectives, activities and performance evaluation. The Control group did not include these lesson components in the Web sites they created. Without such instructional components, the nature of the sites created is much more informational rather than instructional/educational. Had the Control group been required to rework their lessons so that the lessons included instructional components, the results of the comparisons between the Control group and Treatment group in regard to the efficiency (time and effort) and appeal (low anxiety, high confidence, liking, usefulness and intended future use) may have been substantially different.

Restricting this study to a university setting is the greatest strength while also being the greatest weakness. Template design and interaction of pre-service teachers may not reflect the views of students at other universities, smaller or larger colleges, and/or community colleges. The university setting, however, offers the opportunity to assess students' perspective as they create and layout their lessons using the template format. Ability to generalize is largely limited due to the sample selection.

A third limitation is that this study uses a self-report. Self-reports are susceptible to "error" through the difficulty of eliciting honest, accurate responses. In this study, the participants are not under pressure to produce in order to be paid; nor are they reporting on an issue that will influence their grade, although they may be under a certain amount of time constraint pressure because of their own organizational capabilities. The assignment will be graded "Pass" or "Fail" based upon criteria in the grading rubric; student input from the self-report is not part of the grading criteria. These factors still do not guarantee the truthfulness of the responses. However, they do alleviate the pressure and stress to answer with "teacher pleasing" responses.

A final limitation of this study is control for experimenter contamination. The intervention, T-N-T Web-based lesson template/shell, was designed and developed by the researcher and unquestionably there is researcher bias. The instruction for using the Web editor and the instruction for using T-N-T will be presented by the researcher. Maintaining fidelity during lesson presentation is a limitation. To minimize this limitation, adherence to guidelines for each scripted lesson will be described in Chapter Three. Another aspect of experimenter contamination is that data collection and data analysis is conducted solely by the researcher and subject to researcher bias. To minimize this limitation, the participants complete four of the six instruments. Of the remaining two instruments one is scored based solely upon component presence and the other is scored based solely upon component functionality.

Description of the T-N-T Template/Shell

Essentially, the lesson template/shell is a complete Web-based lesson minus the content. The template/shell exists as a Web-based resource/tool for the teacher. This template/shell is designed to support a pedagogically sound linear presentation of materials and activities while concomitantly providing a multiplicity of instructional scaffolding cues designed to guide development of the content. Below are screen captures of two pages from the template.

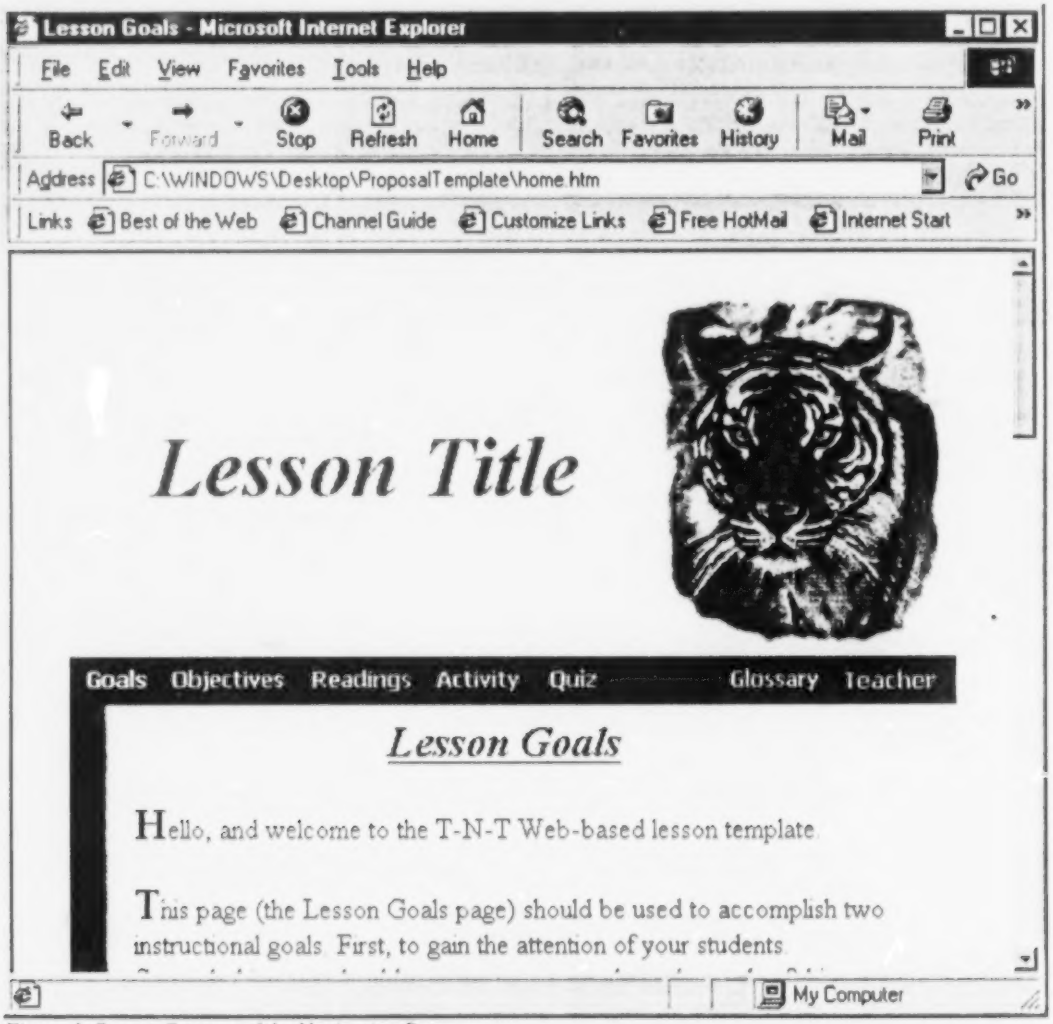
Lesson Goals - Microsoft Internet Explorer
File Edit View Favorites Tools Help
Back Forward Stop Refresh Home Search Favorites History Mail Print
Address C:\WINDOWS\Desktop\ProposalTemplate\home.htm
Go
Links Best of the Web Channel Guide Customize Links Free HotMail Internet Start
Lesson Title
Goals Objectives Readings Activity Quiz Glossary Teacher
Lesson Goals
Hello, and welcome to the T-N-T Web-based lesson template.
This page (the Lesson Goals page) should be used to accomplish two instructional goals. First, to gain the attention of your students.
My Computer

Figure 1. Screen Capture of the Navigation Bar

The navigation bar includes seven links (Goals, Objectives, Readings, Activity, Quiz, Glossary and Teacher). Note that "Goals" is white (inactive link) and the others are red (active links). White text is a visual cue that the user is working in the Goals section. The title "Lesson Goals" directly below the navigation bar is another indicator of location and page purpose. Scrolling down the Lesson Goals page reveals a few lines of direct instruction to the developer.

Each page of the template (excluding Glossary and Quiz) includes such direct instruction and a brief rationale (theoretical foundation) for the suggested approach to content development within each part of the Web-based lesson. The "Glossary" and "Teacher" links are set apart within the navigation bar. This segregation is

BEST COPY AVAILABLE

intentional as glossary and teacher sections are provided as Tools for the teacher/designer and not as having the same instructional rationale/purpose as the other five components of the lesson. The one link located on the navigation bar that does not open a Web page is titled "Teacher." This link is an E-mail link to the instructor.

The lesson template also includes a ready-to-use ten question multiple-choice quiz. The interactive "Quiz" is a JavaScript program that solicits the user to answer questions relevant to the lesson content and receive immediate feedback on their performance.

When providing content for the Quiz section of the lesson, the teacher/designer is prompted to insert questions pertaining to the lesson and potential answers (correct and incorrect). The feedback section of the Quiz is a program designed to give students appropriate information about their performance. Note that in the following screen capture, answers to the various questions have been selected and the user has clicked on the "Calculate Results" button.

The student performance feedback section of the Quiz page provides the student two sets of information. First it furnishes a text-based assessment of their performance and secondly it allows the student to see which questions they answer correctly and incorrectly.

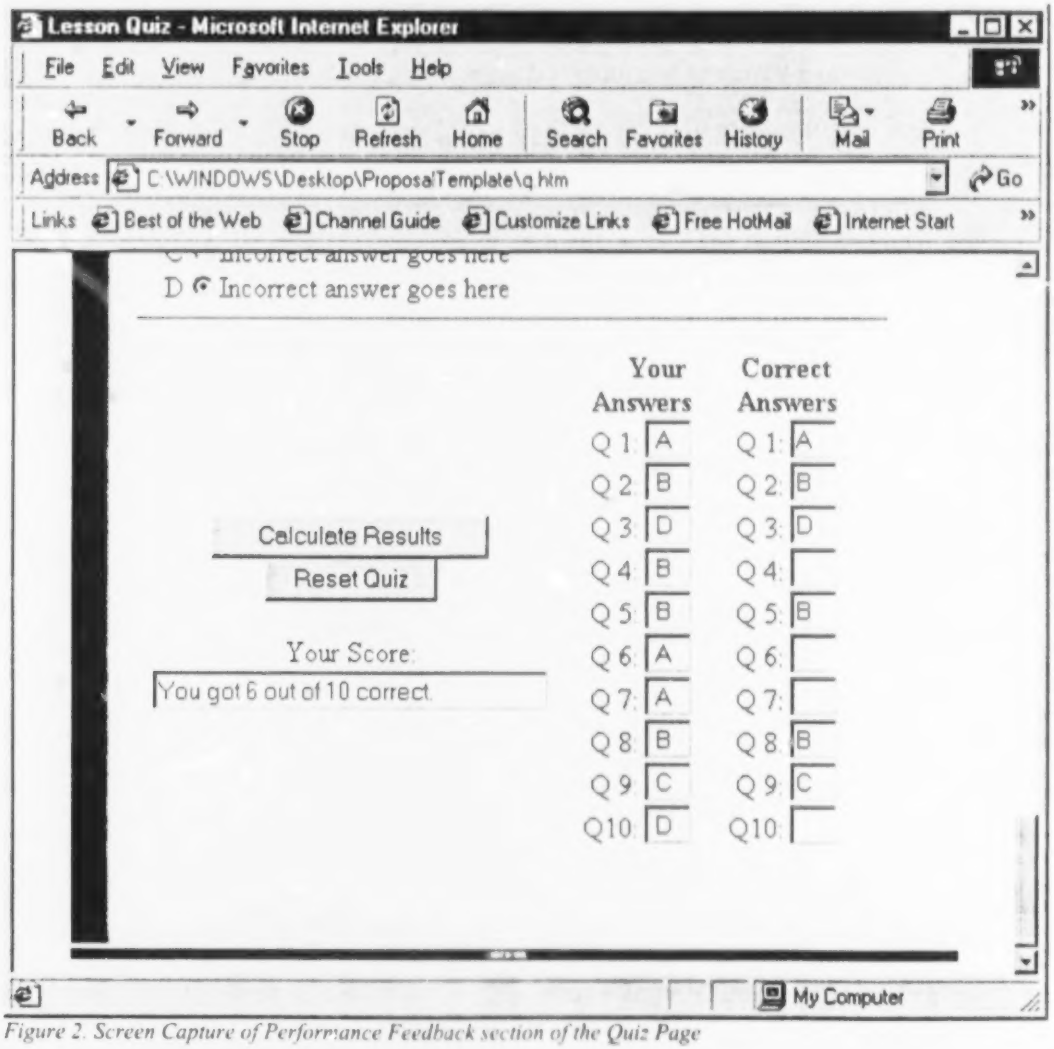

Figure 2. Screen Capture of Performance Feedback section of the Quiz Page

BEST COPY AVAILABLE

Conclusions

This study examined the efficiency (time and effort), effectiveness (inclusion of specific instructional components and functionality of specific technical components), and appeal (anxiety, confidence, liking, usefulness and intended future use) of two lesson developmental alternatives (WE only and WE + T-N-T) by pre-service teachers. Statistical analysis of six hypotheses confirmed that developing Web-based lessons using WE + T-N-T was more effective than using WE only. The analysis also revealed that neither developmental alternative was superior in terms of efficiency or appeal.

Using a tool such a T-N-T significantly reduces the requirements for technical expertise in the development of a Web-based lesson. T-N-T also provides scaffolding for the creation of pedagogically sound instructional environments by focusing attention of the designer on instructional strategies and methodologies.

References

National Center for Educational Statistics (NCES). (1999). The condition of education (NCES Publication No. NCES 99-022) [On-line]. Available: http://www.ed.gov/NCES/pubs/99022.html

Smith, P. L., & Ragan, T. J. (1993). Instructional design. New York: Merrill.